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Merhar et al.

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(54) **SUPPORT FOOT FOR APPLYING AND DISTRIBUTING FORCES TO A PRESSURE-SENSITIVE SUBSTRATE AS WELL AS A STAND SYSTEM HAVING SUCH A SUPPORT FOOT**

(71) Applicant: **Hilti Aktiengesellschaft**, Schaan (LI)

(72) Inventors: **Thomas Merhar**, Schaan (LI); **Fritz Hermann**, Landsberg (DE); **Peter Ostermeier**, Diessen (DE)

(73) Assignee: **Hilti Aktiengesellschaft**, Schaan (LI)

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E04D 13/12	(2006.01)
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(58) **Field of Classification Search**

CPC E04D 13/12; E04D 11/005; F24J 2/526; F24J 2/525; F24J 2/523; F24J 2/5264; Y02E 10/47; Y02B 10/20; F24F 13/32

USPC 248/121, 188.1, 188.7, 188.8, 188.9, 248/677, 148, 354.1; 52/126.4, 126.5, 52/126.7, 262, 263

See application file for complete search history.

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Primary Examiner — Anita M King

(74) *Attorney, Agent, or Firm* — Davidson, Davidson & Kappel, LLC

(57) **ABSTRACT**

A support foot (**10**) for applying and distributing forces to a pressure-sensitive substrate, including a baseplate (**12**) for placement onto the substrate and a holder (**18**) which is joined to the baseplate (**12**) and to which the connecting parts (**32**, **72**) can be attached, whereby the holder (**18**) has a first receptacle (**20**) for a first connecting part (**72**) and a second receptacle (**22**) for a second connecting part (**32**). A stand system has at least one support foot (**10**) and at least one, especially C-shaped, mounting rail that is inserted into a receptacle (**20**, **22**, **24**) and that is prevented by a fastener (**56**) from being pulled out of the holder (**18**).

11 Claims, 3 Drawing Sheets

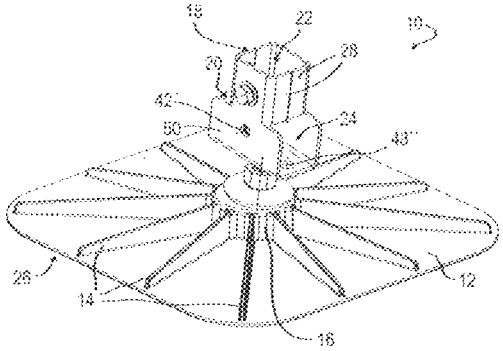

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Fig. 1

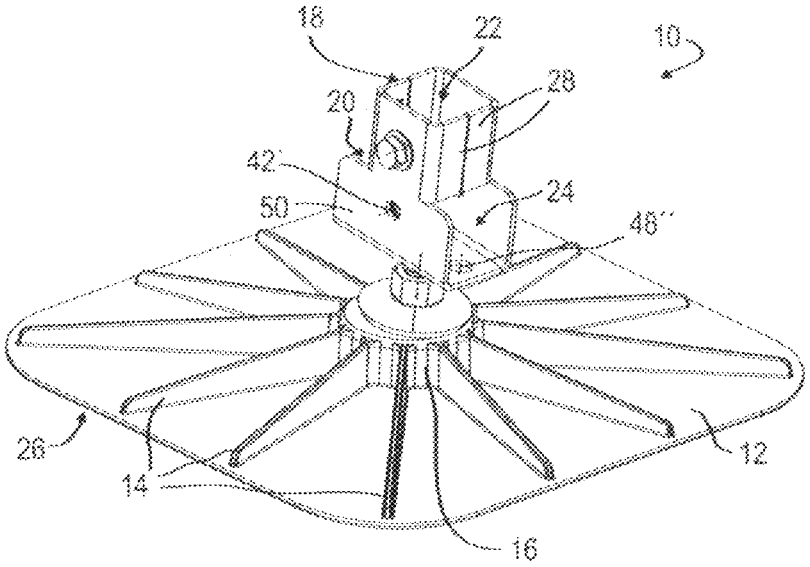
18
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Fig. 2

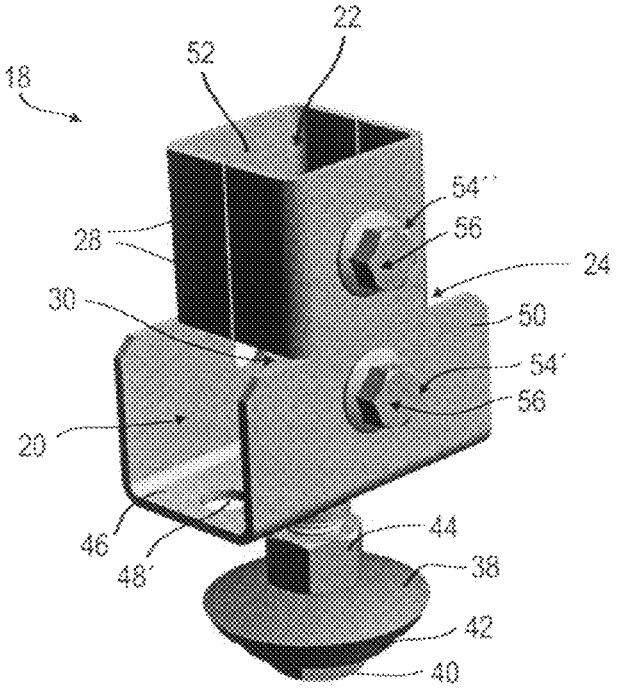
22
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Fig. 3

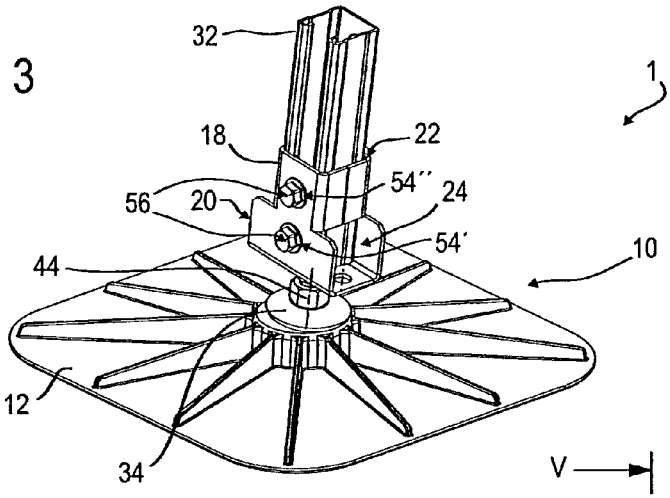


Fig. 4

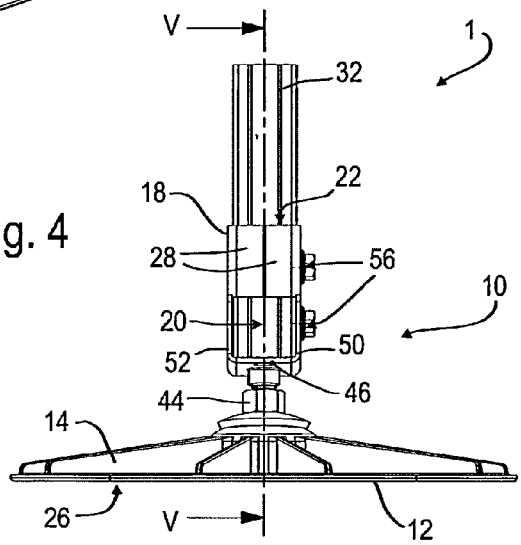


Fig. 5

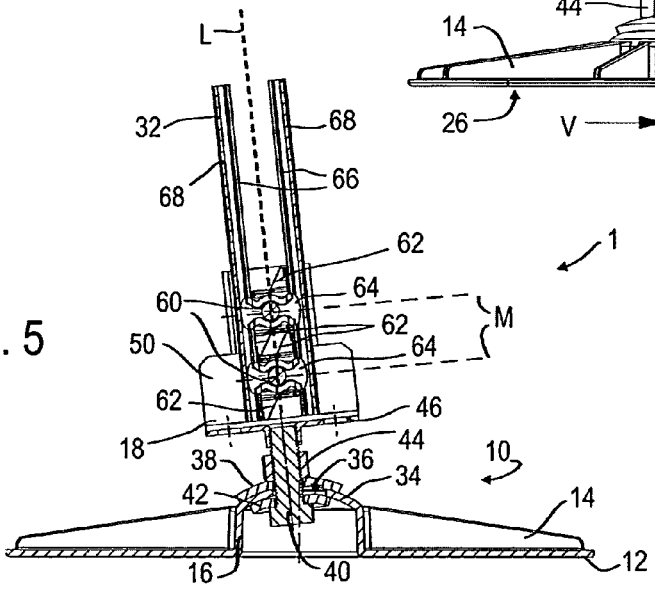


Fig. 6

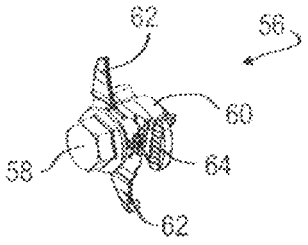


Fig. 7

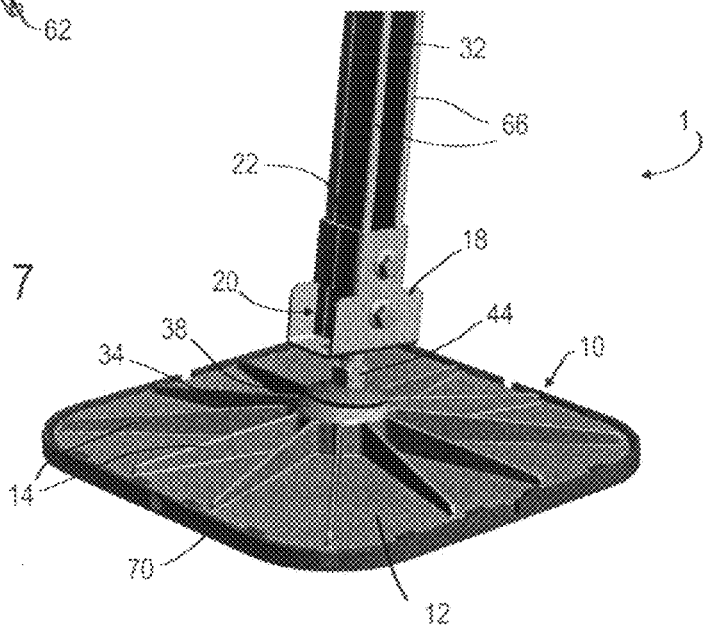
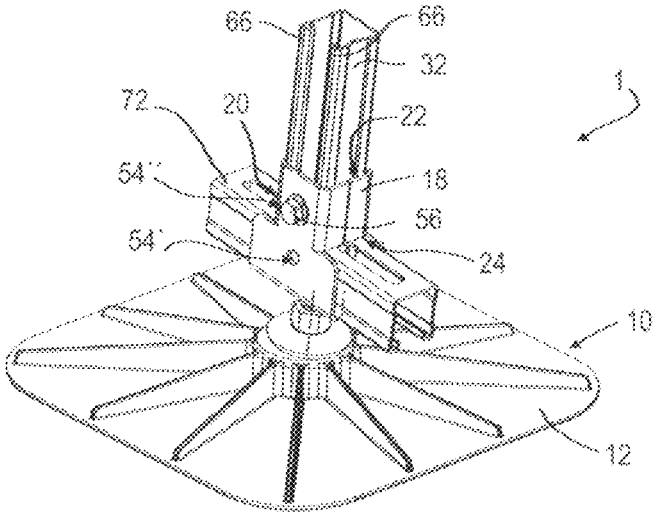


Fig. 8



SUPPORT FOOT FOR APPLYING AND DISTRIBUTING FORCES TO A PRESSURE-SENSITIVE SUBSTRATE AS WELL AS A STAND SYSTEM HAVING SUCH A SUPPORT FOOT

This claims the benefit of German Patent Application DE 10 2012 209 395.8, filed Jun. 4, 2012 and hereby incorporated by reference herein.

The invention relates to a support foot for applying and distributing forces to a pressure-sensitive substrate, comprising a baseplate for placement onto the substrate and a holding element which is joined to the baseplate and to which the connecting parts can be attached. Moreover, the invention relates to a stand system having such a support foot.

BACKGROUND

Stand systems having such support feet are, for example, installations on stands mounted on flat roofs, such as ventilation conduits or ventilation aggregates, air-conditioning systems, pipelines or ductwork. Since flat roofs often have pressure-sensitive sealing films or bitumen sheeting, there is a need to distribute the support load by means of appropriate support feet. Other applications for stand systems having support feet are scaffolding or temporary installations such as bleachers, whereby here, the load is applied to an asphalt surface or to a ground surface.

European patent EP 2 228 501 B1 discloses a support foot of the generic type, which has a base part as well as a sliding part that can be moved at a slant relative to the base part by a few degrees in an axial direction, whereby a vertically oriented mounting rail can be attached to said sliding part. A separate replaceable sliding part is provided so that a horizontally oriented rail can be attached.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a support foot or a stand system that is characterized in that it is easy to handle and can be used universally.

For this purpose, according to a first aspect of the invention, a support foot of the above-mentioned type is provided, in which the holding element has a first receptacle for a connecting part and a second receptacle for a connecting part. In this manner, two connecting parts (for instance, mounting rails) can be attached to the support foot at the same time, or else just one of the receptacles on the holding element can be used for a single connecting part. Thus, the invention creates a support foot that has a wide array of joining possibilities for connecting parts and that is thus particularly simple to adapt to the specific requirements of use.

Preferably, the first receptacle and the second receptacle are oriented at a slant, particularly perpendicularly, with respect to each other. This allows the simultaneous joining of two connecting parts that extend in different axial directions. This embodiment is also advantageous when the support foot is used with only one connecting part since, in contrast to known support feet, the connecting parts that have a different orientation relative to the support foot can be joined using one and the same holding element.

According to a preferred embodiment, the first receptacle is flush with a third receptacle for a connecting part, in particular, it makes a transition into the third receptacle, and the three receptacles are preferably arranged so as to be T-shaped with respect to each other. Thus, the connecting parts can be joined to the holding element from three sides, especially, they can be inserted into this holding element. When the first and the third receptacles make a transition into each other, a connecting part can be simultaneously held by the first and the third receptacles. In particular, the connecting part can be pushed through the first and the third receptacle and thus through the holding element.

As an alternative, it would be conceivable for all three receptacles to be arranged perpendicular to each other, in other words, so that they preferably form an orthogonal base.

Preferably, in a basic position of the holding element, the first receptacle extends essentially parallel to a placement surface on the underside of the baseplate. Thus, when the support foot is used in a stand system installed on a flat roof, the first receptacle is suitable for being joined to an elongated connecting part that is oriented horizontally, while a second receptacle arranged perpendicular to the first receptacle can then simultaneously or alternatingly secure a vertically oriented connecting part. In this context, the term "basic position" of the holding element refers to a position in which the holding element is not positioned at a slant with respect to the baseplate, which can be desirable, for example, in order to compensate for a (slight) inclination of the substrate.

The first receptacle and the second receptacle can have an overlapping area so that the second receptacle makes a transition into the first receptacle, and a connecting part can protrude through the second receptacle into the first receptacle. If a connecting part is held only in the second receptacle, it can be affixed even more securely.

Since the installations for which such support feet are used are often mounting rail constructions having so-called C-profile rails as the connecting parts, the receptacles preferably have a rectangular, especially square, cross section and especially the same cross section. For this reason, the support foot can be combined with commercially available components and can thus be used in an inexpensive and versatile manner. Moreover, a square cross section allows the mounting rails to be joined in 90° increments, namely, by turning the rail around its longitudinal axis.

The first receptacle and/or the third receptacle can have a lower, preferably shared, holding wall, particularly having at least one fastening recess. In addition or as an alternative, fastening recesses can also be provided in other holding walls of the receptacles. In an especially preferred embodiment, the first receptacle as well as the third receptacle have at least one fastening recess, especially in a shared lower holding wall.

Furthermore, at least one of the first and third receptacles can have at least one, preferably two, side holding walls, preferably with a fastening recess, in order to tightly secure the connecting part held therein.

Advantageously, the holding element has two fastening recesses arranged one under the other for purposes of securing a connecting part arranged in the second receptacle.

The fastening recess or fastening recesses that are preferably configured as a through hole serve to receive a fastening element, for instance, by means of a bolt and a wing nut with which a given connecting part is secured in the appertaining receptacle.

The fastening element can comprise, for example, a bolt, especially a screw, as well as a wing nut arranged in the area of the receptacle inside the connecting part.

Especially preferably, the first receptacle, and optionally the third receptacle, are configured so as to be U-shaped, while the second receptacle is configured so as to be ring-shaped.

In one particularly preferred embodiment, the holding walls of all of the receptacles make a transition into each other so as to form one piece; for example, they can be bent out of

a metal sheet. In particular, the first and the third receptacles can be formed by a U-shaped bent metal sheet while the second receptacle is formed by tabs that are angled away from the leg ends of the U-shaped bent metal sheet and that combine to form a ring. Here, the receptacles are preferably arranged in a T-shape with respect to each other. The holding element is thus a simple bent part configured in one piece and made of a metal sheet, which is stable in terms of its structure and inexpensive to manufacture.

Since it is often the case that the substrate on which such a support foot rests is (slightly) slanted so that water can run off, for example, in the case of a flat roof, the baseplate and the holding element are preferably joined to each other so that the angle of inclination can be adjusted, whereby a locking means is provided in order to firmly position the baseplate and the holding element with respect to each other at the selected angle of inclination. Thus, the installation provided on the slanted substrate can be oriented horizontally or vertically very precisely by means of an angle compensation on the support foot.

Advantageously, the baseplate has a first sliding section with a round hole into which one end of the holding element engages. As a result, the holding element can be swiveled vis-à-vis the baseplate in at least two spatial directions, whereas the support feet known from the state of the art, which employ a slot for adjusting the inclination, only allow an angle adaptation in one spatial direction.

Preferably, the first sliding section is configured so as to be shaped like a spherical cap, and especially, a second sliding section that is shaped like a spherical cap and that is in contact with the first sliding section is situated on the holding element. Such a universal ball joint constitutes a simple configuration of an articulated joint that can be adjusted, especially pivoted and turned, in several directions. It also allows a rotation of the holding element around the vertical, so that an approximately vertical connecting part accommodated in the second receptacle can be turned around its longitudinal axis.

In order to attain, for instance, a connection of the baseplate and the holding element that can be reliably secured and whose angle of inclination can be adjusted, the holding element can have a locking section that is preferably shaped like a spherical cap and that engages behind the first sliding section of the baseplate. In order to secure the angular position of the holding element, the sliding section of the baseplate can be clamped between the sliding section of the holding element and another element, especially the locking section.

According to another aspect of the invention, a stand system having at least one support foot of the above-mentioned type is provided which additionally has at least one, especially C-shaped, mounting rail that forms the connecting part, that is inserted into a receptacle and that is prevented by a fastener from being pulled out of the holding element. As already mentioned, such fasteners may especially comprise wing nuts that are inserted into the C-rail from the open side and that engage behind the edges of the rail that are bent inwards.

BRIEF DESCRIPTION OF THE DRAWINGS

Additional features and advantages of the invention ensue from the description below of several advantageous embodiments making reference to the accompanying drawing. The following is shown:

FIG. **1**: a perspective view of a support foot according to the invention;

FIG. **2**: a perspective view of a holding element of the support foot from FIG. **1**;

FIG. **3**: a perspective partial view of a first embodiment of a stand system according to the invention;

FIG. **4**: a side view of the stand system from FIG. **3**;

FIG. **5**: a sectional view of the stand system along the line V-V in FIG. **4**;

FIG. **6**: a fastener of the stand system of the preceding figures;

FIG. **7**: a perspective partial view of a second embodiment of a stand system according to the invention; and

FIG. **8**: a perspective partial view of a third embodiment of a stand system according to the invention.

DETAILED DESCRIPTION

FIG. **1** shows a support foot **10** according to the invention, for applying and distributing forces to a pressure-sensitive substrate. The support foot **10** has a baseplate **12** for direct or indirect placement onto the substrate and it can consist, for example, of an injection-molded part made of plastic or metal, and, for example, it has several reinforcement ribs **14** that extend outward from a central cylindrical area **16**.

In the embodiment shown in FIG. **1**, the baseplate **12** has an approximately square shape with rounded-off corners, although it could also have any other desired shape, for instance, rectangular or round.

The support foot **10** also comprises a holding element **18** which is shown separately in FIG. **2** and to which several connecting parts, especially C-shaped mounting rails of the type shown in FIGS. **7** and **8**, can be attached.

For this purpose, the holding element **18** has a first receptacle **20**, a second receptacle **22** and a third receptacle **24**, into each of which a mounting rail can be inserted.

In this context, the first receptacle **20** and the second receptacle **22** are oriented perpendicular to each other, whereas the third receptacle **24** is flush with the first receptacle **20** and makes a transition into the first receptacle **20**. As can be seen in the figures, the third receptacles **20**, **22**, **24** thus have a T-shaped configuration.

In the basic position of the holding element **18** shown in FIG. **1**, the first receptacle **20** and the third receptacle **24** extend essentially parallel to a placement surface **26** on the underside of the baseplate **12** by means of which the baseplate **12** or the entire support foot **10** rests on the substrate.

The first receptacle **20** and the third receptacle **24** are formed by a U-shaped bent metal sheet at whose leg ends that are tabs **28** that are angled away and that combine to form a preferably closed ring, or else fundamentally, an open ring having a square cross section, thus forming the second receptacle **22**.

Owing to the one-piece configuration, the first receptacle **20** and the second receptacle **22**, or the second receptacle **22** and the third receptacle **24**, have an overlapping area **30** so that, as can be seen in FIGS. **3** to **5**, a vertically oriented connecting part **32**—here a C-shaped mounting rail—can protrude through the second receptacle **22** into the first receptacle **20** and into the third receptacle **24**.

All of the receptacles **20**, **22** and **24** also have a shared cross section so that one and the same connecting part **32** can be inserted into any one of the receptacles.

The support foot **10** and the connecting part **32** form one part of a stand system **1** which is employed, for example, for the installation of ventilation conduits, air-conditioning system systems or the like on flat roofs.

Here, in order to compensate for a slant of the substrate, the baseplate **12** and the holding element **18** are joined to each other in such a way that the angle of inclination can be adjusted (in particular, see FIG. **5**), namely, by means of a

universal ball joint that is formed by a first sliding section **34** shaped like a spherical cap and having a round hole **36** (or else a slot), and that is provided on the baseplate **12** in the central cylindrical area **16**.

Moreover, the universal ball joint comprises a second sliding section **38** that is arranged on the holding element **18** and that rests at least partially on the first sliding section **34**. At a lower end **40** of the holding element **18** that projects into the round hole **36**, parallel to this second sliding section **38**, which is likewise shaped like a spherical cap, there is a locking section **42** that is shaped like a spherical cap and that engages behind the first sliding element **34** of the baseplate **12**, that is to say, it presses from below against the sliding section **34**. The sections **34** and **38**, which are shaped like spherical caps, and the locking section **42**, likewise shaped like a spherical cap, preferably all have the same center point, which ensures reliable pivoting.

Owing to the universal ball joint, the angle of inclination of the holding element **18** can be adjusted relative to the baseplate **12** in any desired direction in a plane parallel to said baseplate **12**, whereby the maximum adjustment angle is prescribed by the size of the round hole **36**.

In order to firmly position the baseplate **12** and the holding element **18** at a slant that has been selected, a locking means **44** in the form of a nut is arranged on the holding element **18** directly above the second sliding section **38** and it acts on said second sliding section **38** in such a way that any additional, unintentional shifting of the universal ball joint is not possible since the sliding section **34** is clamped between the sections **38** and **42**.

As can be best seen in FIG. **2**, the first receptacle **20** and the third receptacle **24** have a shared lower holding wall **46** that runs approximately parallel to the contact surface **26** of the baseplate **12** when the angle of inclination of the basic position of the holding element **18** has not been adjusted.

In this shared lower holding wall **46**, there are two fastening recesses **48'** and **48"**, whereby one fastening recess **48'** is located in the area of the first receptacle **20**, while the other fastening recess **48"** is located in the area of the third receptacle **24**.

Furthermore, the first receptacle **20** and the third receptacle **24** are limited by two side holding walls **50** and **52** that, at the same time, form opposite side holding walls for the second receptacle **22**.

In this context, the side holding wall **50** has two fastening recesses **54'** and **54"** into which the turn-fastener **56**—here in the form of screws **58** with the associated wing nuts **60**—are inserted (in particular, see FIG. **6**).

The fastening recesses **54'** and **54"** are arranged one above the other and parallel to a longitudinal axis L of the connecting part **32**, whereby the distance of the lower fastening recess **54'** from the lower holding wall **46** as well as the distance between the two fastening recesses **54'** and **54"** are selected in such a way as to yield the easiest possible pre-installation.

As is shown in FIG. **6**, the turn-fastener **56** comprises a head bolt **58** and a wing nut **60** arranged thereon and having two wings **64** by means of which the wing nuts **60** engage behind the inward bent edges **66** of the free ends of the side legs **68** of the U-shaped connecting part **32**. Preferably, the turn-fastener **56** can also have a pressure plate **62**.

FIG. **7** shows another embodiment of the stand system **1** according to the invention, whereby here, there is also a cushioning or anti-slip mat **70** that is arranged on the lower placement surface **26** of the baseplate **12**.

FIG. **8** shows a third embodiment of the stand system **1** according to the invention. Here, aside from the vertical connecting part **32**, there is a second connecting part **72** that extends essentially in the horizontal direction and that penetrates through the first receptacle **20** as well as through the third receptacle **24**, both of which are likewise C-profile rails.

Unlike in the embodiment having only one vertical connecting part **32** (FIGS. **3** to **5** and **7**), in the case of two connecting parts **32**, **72**, the vertical connecting part **32** is secured in the upper fastening recess **54"** only by means of a turn-fastener **56**. The horizontal connecting part **72** is secured to the holding element **18** from below in the first and third receptacles **20**, **24** by means of the fastening recesses **48'** and **48"**. A conceivable alternative would also be fastening by means of only one of the two fastening recesses **48'** or **48"**.

It can also be provided that another connecting part is held in each of the three receptacles **20**, **22** and **24**. Here, due to the overlapping area **30**, the connecting part preferably can protrude into the second receptacle between the two other connecting parts of the first and third receptacles that are flush with each other.

Depending on the number or arrangement of the connecting parts **32**, **72**, these can also be affixed by means of different fastening recesses **48'**, **48"**, **54'**, **54"**.

Moreover, since the vertical connecting part **32** as well as the horizontal part **72** can have slots in the lower wall opposite from the elongated slot and in the side walls, the support foot **10** can be joined in 90° increments (rotation around the longitudinal axis of the rail).

Owing to the universal ball joint, the horizontal connecting part **72** can also be continuously turned around the vertical relative to the baseplate **12**.

Without replacing the holding element **18**, either a horizontal connecting part **72** or a vertical connecting part **32**, or else a horizontal and a vertical connecting part can be attached simultaneously to the support foot **10** according to the invention. Moreover, it is, of course, also possible to provide two horizontal connecting parts **72**, one of which is held in the first receptacle **20** while the other is held in the third receptacle **24**, with or without an additional vertical connecting part **32**.

What is claimed:

1. A support foot for applying and distributing forces to a pressure-sensitive substrate, comprising:

a baseplate for placement onto the substrate;

a holder joined to the baseplate, first and second connecting parts being attachable to the holder, the holder having a first receptacle for the first connecting part and a second receptacle for the second connecting part, wherein the first receptacle is flush with a third receptacle for the first connecting part or a further connecting part; and

the first receptacle makes a transition into the third receptacle, the first, second and third receptacles being arranged so as to be T-shaped with respect to each other.

2. The support foot as recited in claim **1** wherein in a basic position of the holder, the first receptacle extends parallel to a placement surface on the underside of the baseplate.

3. The support foot as recited in claim **1** wherein the first and second receptacles have a rectangular cross section and/or the same cross section.

4. The support foot as recited in claim **1** wherein the first receptacle and/or the third receptacle have a lower holding wall having at least one fastening recess.

5. The support foot as recited in claim **4** wherein the first and third receptacle share the lower holding wall.

6. The support foot as recited in claim **1** wherein at least one of the first and second receptacles has at least one side holding wall.

7. The support foot as recited in claim **6** wherein the at least one side holding wall includes two side holding walls.

8. The support foot as recited in claim 7 wherein the first and the third receptacles are formed by a U-shaped bent metal sheet while the second receptacle is formed by tabs angled away from leg ends of the U-shaped bent metal sheet, the tabs combining to form a ring.

9. A stand system comprising:

at least one support foot as recited in claim 1 and at least one mounting rail defining at least one of the first and second connecting parts and inserted into at least one of the first and second receptacles; and

a fastener preventing the at least one of the first and second connecting parts from being pulled out of the holder.

10. The stand system as recited in claim 9 wherein the at least one mounting rail is C-shaped.

11. A support foot for applying and distributing forces to a pressure-sensitive substrate, comprising:

a baseplate for placement onto the substrate;

a holder joined to the baseplate, first and second connecting parts being attachable to the holder, the holder having a first receptacle for the first connecting part and a second receptacle for the second connecting part, wherein the first receptacle and the second receptacle have an overlapping area so that the second connecting part can protrude through the second receptacle into the first receptacle.

* * * * *